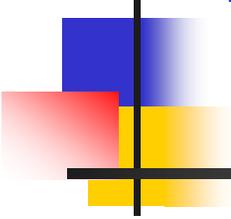


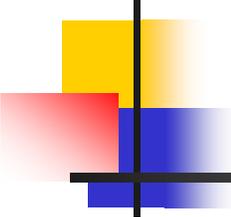
Consumer Study Results and Historic Overview of Instrument Assessment for Tenderness



Jeff W. Savell

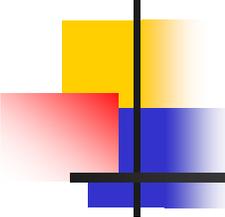
Regents Professor and E.M.
“Manny” Rosenthal Chairholder

Texas A&M University



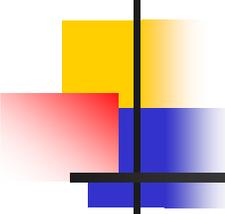
Basic Factors to be Addressed

- What characteristics are most important for tenderness?
- How and where (specific cut, muscle, or a point within the process for verification) these tenderness characteristics should be evaluated?
- If needed, what processes should be included to adequately address the expectations of the requirements for a standard?



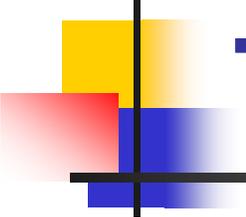
Tenderness Research

- Prior to 1960s, major focus was on connective tissue contribution to tenderness.
- Beginning in 1960s and first led by New Zealand researchers, emphasis began on myofibrillar contribution.
 - Cold shortening's impact on tenderness discovered.



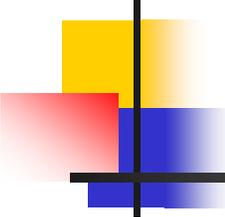
Tenderness Research Thrusts

- Cold shortening prevention
 - Carcass suspension
 - Electrical stimulation
 - Alternative chilling methods
- Enzymatic aspect
 - Lysosomal enzymes
 - Calcium related (CAF, CDP, calpains)
- Grade based
 - Maturity (e.g., Smith et al., 1982)
 - Marbling (e.g., Smith et al., 1984)
 - Grade (e.g., Smith et al., 1987)



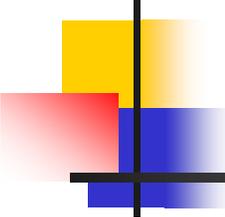
Tenderness Research Thrusts

- Mechanical methods
 - Blade tenderization
- Exogenous enzymes
 - Papain and other tropical plant enzymes
- Calcium chloride infusion/injection
- Enhancement processes for pork and beef



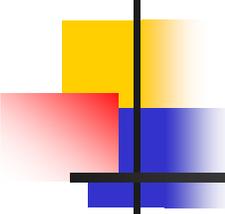
What do we Know About Tenderness?

- Marketplace prices greatly influenced by tenderness
 - Retail price for Prime tenderloin = \$24.99/lb
- Consumers willing to pay more for tender products
 - Boleman et al. (1997)
 - Shackelford et al. (2001)



What About Tenderness Thresholds?

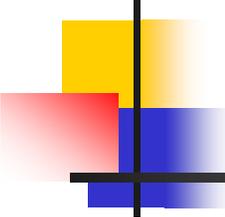
- Shackelford et al. (1991) proposed confidence intervals for WBS values
 - 3.9 kg and 4.6 kg
- Belew et al. (2003) proposed four categories:
 - “Very Tender” -- $WBS < 3.2$ kg
 - “Tender” -- $3.2 < WBS < 3.9$ kg
 - “Intermediate” -- $3.9 < WBS < 4.6$ kg
 - “Tough” -- $WBS > 4.6$ kg



Instrument Assessments of Tenderness

- Warner-Bratzler Shear (WBS)
 - Standalone unit
 - Instron
- Slice Shear Force (SSF)

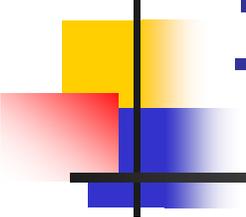
The more force (measured in pounds, kilograms or Newtons) to cut sections or cores, the tougher the meat.



Large-Scale Consumer Studies

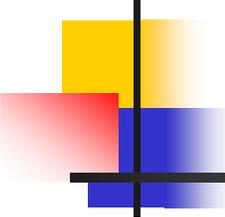
- Beef Customer Satisfaction -- Four cities
 - Early to mid-1990s
 - Neely et al. (1998, 1999), Lorenzen et al. (1999), Savell et al. (1999) -- “A Study of Interactions”
 - Cut, Degree of Doneness, Cookery Method -- Major impact
 - Grade -- Minor impact
 - Lorenzen et al. (2003) -- Trained panel, WBS and in-home consumer evaluations
 - “While relationships exist between consumer and trained sensory measurements, it is difficult to predict from objective data how consumers will rate meat at home.”

Challenge with Degree of Doneness and Influence on Tenderness



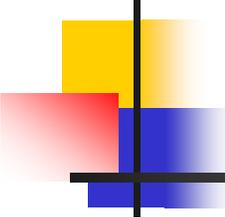
QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.

Lorenzen et al. (2003)



Instruments to Predict Tenderness

- BeefCAM
- MARC system
- Others



Where do we go from here?

- Points to consider:
 - Thresholds across species, across muscles
 - Testing versus predicting
 - How to validate programs or processes
 - Mechanical versus sensory panel assessments